

REMARKS

Claims 1, 3-16, 18-19 are pending. Claims 1 and 3-16, are rejected; Claims 18-19 are objected to.

Claims 1, 3-7, 9, 10, and 16 are rejected under 35 U.S.C. §102 (b) as anticipated by or, in the alternative, under 103 (a) as obvious over Hansen et al. US 5,589,256.

Claim 8 is rejected under 35 U.S.C. §103(a) as being unpatentable over Hansen et al. ('256) in view of Smith et al. U.S. 2002/0090511.

Claims 1,3-16 are rejected under 35 USC § 103(a) as unpatentable over Hansen et al. ('256) in view of Hansen et al. US 5,789,326.

Claims 18-19 are objected to as being dependent upon a rejected claim but would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claims.

Claims 1, 5-8 and 10-15 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over (renumbered) claims 1-9 and 11-12 in copending Application No. 10/748977.

Claims 1, 5-8, 10-12 and 16 are provisionally rejected under the doctrine of obviousness-type double patenting as being unpatentable over Claims 1-8 of copending Application No. 10/815206.

Claims 1, 3-8, 10, and 12-16 are rejected under the doctrine of obviousness-type double patenting as being unpatentable over Claims 1-14 of copending Application No. 10/748969.

The Rejection Of Claims 1, 3-7, 9, 10 and 16 Under 35 U.S.C. 102 (b)

Applicants have amended Claim 1 to incorporate the specific amounts of the polyol from Claim 18 into Claim 1. The bulk property is deleted from the claim. The limitation of bulk previously incorporated from Claim 17 into Claim 1 was reintroduced as new Claim 20.

Applicants submit the Examiner has not established a *prima facie* case of anticipation. A *prima facie* case of anticipation requires the presence of a single prior

art reference disclosure of each and every element of the claimed invention arranged as in the claims.

The Hansen et al. invention concerns polymeric and non-polymeric binders for fibers and the use of such binders in binding particles to fibers. In particular embodiments the invention concerns binding superabsorbent particles to cellulosic fibers which may then be used, for example, to make absorbent fibers that are densified and incorporated into cellulosic products, column 1, lines 6-14.

Binders form coordinate covalent bonds or hydrogen bonds. The *binding through hydrogen bonds* of a carboxylic acid with an alcohol (R^1 could conceivably be a hydroxyl group from cellulose) is shown in the figure in column 16 lines 30-35. The binding of a polyol to cellulose, *through hydrogen bonds* is shown in column 14, line 10 – 30. On the other hand polycarboxylic acid crosslinking agents can react with, for example, cellulose to form a covalent bond with cellulose. When this occurs, the crosslinking agent which may have been able to act as a binder also no longer has any binding capability.

Hansen et al. do not disclose cellulose fibers reacted with an effective amount of of a crosslinking agent in the presence of from about 1% to about 10% of the weight of cellulose fiber of a C_4 - C_{12} polyol, the Whiteness Index, $WI_{(CDM-L)}$ greater than about 69.0, and an L value greater than about 94.5. Because Hansen et al. do not disclose all the elements of the claim as arranged in the claim, the Examiner has not established a *prima facie* case of anticipation. Withdrawal of the rejection is respectfully requested.

The Rejection Of Claims 1, 3-7, 9, 10 and 16 Under 35 U.S.C. 103 (a)

For a *prima facie* rejection, there must be a suggestion, teaching or motivation, either in the references or in the knowledge generally available to modify a reference, there must be a reasonable expectation of success, and all the claim limitations must be taught or suggested in the prior art.

The Hansen et al. invention concerns polymeric and non-polymeric binders for fibers and the use of such binders in binding particles to fibers. In particular embodiments the invention concerns binding superabsorbent particles to cellulosic fibers which may then be used, for example, to make absorbent fibers that are densified and incorporated into cellulosic products, column 1, lines 6-14.

Binders form coordinate covalent bonds or hydrogen bonds. The *binding through hydrogen bonds* of a carboxylic acid with an alcohol (R^1 could conceivably be a hydroxyl group from cellulose) is shown in the figure in column 16 lines 30-35. The binding of a polyol to cellulose, *through hydrogen bonds* is shown in column 14, line 10 – 30. On the other hand polycarboxylic acid crosslinking agents can react with, for example, cellulose to form a covalent bond with cellulose. When this occurs, the crosslinking agent which may have been able to act as a binder also no longer has any binding capability.

The Examiner states that Hansen et al. in the '256 reference discloses crosslinked cellulosic fibers comprising particle binders in the Abstract. For clarification, the reference in the Abstract refers to cellulose fibers that have been crosslinked with a crosslinking agent and then a binding agent added to secure particles. An example of this is in Example XIII where HBA, a high bulk intrafiber crosslinked fiber is treated with a glycerin binder, column 28, lines 20-31. As cited by the Examiner, column 6, lines 14-23 do not refer to crosslinked fibers, rather, only to suitable cellulosic fibers to which superabsorbent particles are adhered by a binder. The reference to column 38, lines 16-28 only discloses application of chemicals such as crosslinking agents to a mat and the crosslinking agents may be, for example, DMDHEU or citric acid. Additional steps such as fiberizing, drying and curing are described in column 38, line 65 – column 41, line 18. Note this description does not disclose crosslinked cellulosic fibers with particle binders or crosslinking of cellulose with a crosslinking agent in the presence of a polyol. Various non-polymeric polycarboxylic acids and polyols can be used as binders, column 16, lines 57-67. Of the seven polycarboxylic acids cited, only two, citric acid and tartatic acid are α -hydroxypolycarboxylic acids. In column 20, lines 34-40, Hansen et al. state that the functionalites of non-polymeric binders may be selected from the group of glycerin (a polyol), glyoxal (a polyaldehyde), ascorbic acid (a polycarboxylic acid and a hydroxyacid), urea, (a polyamide), various polyols and urea derivatives. The same column, lines 41-61 cites twenty three subgroupings which can be used as binders.

In column 19, lines 50 – 56, and line 61, Hansen discloses that non-polymeric binders may be selected *independently* or in *combination* from the group consisting of an amino alcohol, a polycarboxylic acid, a polyol, a hydroxy acid, an amino acid, an amide

and a polyamine and indicates, among others, that a polycarboxylic acid and a polyol is one of a preferred group [*of nineteen (19) generic binders*] for binding purposes. In this context, Hansen does not state that the combination can be used in *crosslinking cellulose* rather, a polycarboxylic acid and a polyol is one of a preferred group of nineteen (19) *binders*. If, as Hansen states, the *binders* can be selected *independently* or *in combination* and *if* the binders were indeed all crosslinking agents, then a polyol such as sorbitol would show an increase in wet bulk and perhaps an increase in the Whiteness Index in the experiments in the Stoyanov Declaration which was submitted in the response dated October 9, 2006. The declaration, however, categorically proves that acyclic polyols such as sorbitol and xylitol do not crosslink as evidenced by the low bulk values and neither do they result in an increase the Whiteness Index. The fact that Hansen et al. discloses that the binders can be a combination of a polycarboxylic acid and a polyol column 19, lines 50 -56 and line 61, does not mean that any polycarboxylic acid or any polyol, if used independently, or in combination of the polyol and polycarboxylic acid will yield the fiber Whiteness Index properties in the instant invention. In fact there is no motivation to try the combination since when polyols such as sorbitol and xylitol are used independently in the reaction with cellulose, as in the Stoyanov declaration, there is no increase in bulk but more importantly, there is no positive change in Whiteness Index (Samples H, I, sorbitol and Samples J and K, xylitol). Also, when a crosslinking agent such as citric acid (which Hansen et al. also cite as a binder) is used *independently* in preparing high bulk fibers, the bulk increases but the Whiteness Index decreases significantly as shown in the Stoyanov declaration, Sample C, where the Whiteness Index decreased to 68.69 from the control, Sample B of 77.87. Thus the skilled artisan would not look to combining a polyol which has no effect on the Whiteness Index with a polycarboxylic acid such as citric acid (an α - hydroxypolycarboxylic acid) which has an adverse effect on the Whiteness Index to improve the color of crosslinked fibers since when used independently they teach away from the instant invention. Thus the increase in Whiteness Index, as shown in the Stoyanov Declaration when a polyol such as sorbitol at a level of 2 to 6 % by weight cellulose and a crosslinking agent such as citric acid are combined in the crosslinking reaction gives unexpected results. Furthermore, Hansen et al. does not disclose which species of polycarboxylic acids in combination with which

species of polyols will yield the cited Whiteness Index properties in the instant invention. Also, the claimed amounts of polyols are not cited. Thus it would not be obvious to one skilled in the art to apply the specifically claimed amounts of polyols to the fibers. Applicants submit that on this basis the prior art does not teach the identical chemical structure and therefore the fiber Whiteness Index properties the Applicants disclose are not present.

In the context of forming high bulk fiber with intrafiber covalent crosslinks, column 37, line 16 – column 42, line 63, Hansen et al. state that particle binders and particles can be added before, after, or simultaneously with curing, column 42, lines 32 and 33. Curing in the presence of a binder is not usually a problem because the binder cannot participate in the intra fiber crosslinking reaction and the binder is not affected by the curing step. In certain situations, however, the binder can function as a crosslinking agent and form covalent intrafiber crosslinks. This must be read in the context of Example XXVI, column 41, line 24-33 where it is stated that dimethyloldihydroxyethylene urea is used as a crosslinking agent. Later in the same context Hansen et al. state that *polycarboxylic acids (such as citric) polyols (such as propylene glycol) and polyamines (such as ethylene diamine)* can function as crosslinking agents and are consumed during the curing step in the formation of covalent crosslinking agents, column 42, lines 39-43. Note that Hansen et al. do not state that *combinations* of polyols, polycarboxylic acids and polyamines can be used for crosslinking rather, that these materials, independently, can function as crosslinking agents. Accordingly in the limited case in which the crosslinking agent is also a binder, steps should be taken to prevent the binder from being consumed as a crosslinker in the step thus maintaining its binding ability. (Here again Hansen et al. do not state *combinations of binders* are used). Hansen et al. state that the fibers should contain at least 20 % by weight water to inhibit ester bond formation during curing so that adequate *binder* will remain in the fibers to bind the particles to the fibers, column 42, lines 50- 63. Stated in another way, crosslinking with the binder destroys the binder and makes it unavailable to bind the particles, the very object of the Hansen et al. reference and therefore the skilled artisan would not look to the Hansen et al. reference for crosslinking which makes his invention inoperative.

Applicants submit that even in these situations where the binder may act as a crosslinking agent, Hansen et al. do not teach the combination of a crosslinking agent and a polyol in the intrafiber crosslinking reaction to arrive at the instant invention of Claim 1. Neither do Hansen et al. disclose which polyol is in combination with which polycarboxylic acid in the crosslinking reaction with cellulose and the amount of polyol as in the instant invention. Furthermore, Hansen et al. is only an invitation to virtual endless experimentation. Hansen et al. give no guidance to the skilled artisan as to which binders or combination of binders from the group to select to achieve the instant invention. While Hansen et al. state that polyols, polyaldehydes, polycarboxylic acids and polyamines *can* crosslink, there is no guidance given as to which genus or species within the genus, in combination, can crosslink to arrive at the instant invention. Thus the skilled artisan would be required to perform virtually endless experimentation to arrive at the instant invention.

In a counterpart patent by Hansen et al, US 6,340,411, which the Examiner cited in the previous Office Action of July 7, 2006, it was shown in the response of October 9, 2006 that, for example, of the 22 compounds listed in column 4, lines 52-60, of the '411 patent that 231 experiments would have to be conducted to determine which compounds crosslinked and further which combination of compounds would function to arrive at the claimed invention. This is based on the formula $n! / (k! * (n-k)!)$ where n is the number of compounds, and k is the number in each combination, i.e. 2. Thus substituting the numbers the formula is $22! / (2! * (22-2)!)$ or 231 experiments would have to be conducted to determine which compounds crosslink and which compounds, in combinations of two, would give the instant invention. If sorbitol, glycerin, propylene glycol, and mixtures thereof, mentioned in column 59, lines 30 and 31 were included for a total of 25 compounds and mixtures of the compounds then 300 experiments would have to be conducted to determine which compounds, in combination, could be used to arrive at the instant invention. Similar arguments hold in the case of the '256 patent except that the number of binders or combination of binders is different.

The '256 patent does not require either the binder or the crosslinking agent to be a polyol as do the instant claims which require a crosslinking agent and a polyol.

In addition, the Stoyanov declaration shows that some polyols such as sorbitol and xylitol do not crosslink at the levels claimed.

The Hansen et al. reference does not provide a motivation to crosslink cellulose with a crosslinking agent in the presence of a polyol since, as shown in the Stoyanov declaration, when a polyol such as sorbitol and a crosslinking agent such as citric acid are used independently in a crosslinking reaction the Whiteness Index is adversely affected, particularly in the case of citric acid. Thus the skilled artisan would not be motivated to explore the combination yet when the combination is used, it has been surprisingly and unexpectedly discovered that Whiteness Index results are significantly increased. The reference does not teach the type of crosslinking agent nor the type and amount of polyol as in the instant invention. Hansen et al. is only an invitation to virtual endless experimentation. Hansen et al. give no guidance to the skilled artisan as to which binders or combination of binders from the group to select to achieve the instant invention. While Hansen et al. state that polyols, polyaldehydes, polycarboxylic acids and polyamines *can* crosslink, there is no guidance given as to which genus or species within the genus, in combination, can crosslink to arrive at the instant invention. Thus the skilled artisan would be required to perform virtually endless experimentation to arrive at the instant invention. Furthermore, Hansen et al. do not disclose the Whiteness Index, the L value, the wet bulk or brightness of the claims. Withdrawal of the rejection is respectfully requested.

The Rejection Of Claim 8 Under 35 U.S.C. 103 (a)

Claim 8 is rejected under 35 U.S.C. §103(a) as being unpatentable over Hansen et al. ('256) in view of Smith et al. U.S. 2002/0090511.

Claim 8 is dependent on Claim 1.

Applicants submit there is no motivation or suggestion to combine the references to arrive at the claimed invention.

The Smith et al. invention relates to the use of refined cellulose fiber prior to crosslinking to achieve crosslinked fibers with low median desorption pressures and improved fluid drainage in acquisition and / or distribution layers compared to

similar unrefined fibers, page 3, paragraph 39. Smith et al. do not teach crosslinking of cellulose in the presence of a polyol, the amounts of polyol, the Whiteness Index greater than 69, and *L* values greater than about 94.5. The list of crosslinking agents is extensive and includes malic acid. However, even if one would combine the references, all the elements of the combined claims would not be present.

When cellulose is crosslinked with citric acid, as in the Stoyanov Declaration, the Whiteness Index is adversely affected. Thus the skilled artisan would expect similar results with malic acid and there would be no motivation to combine malic acid, which would be expected to adversely affect the Whiteness Index, with a polyol such as sorbitol which has been shown not to crosslink or improve the Whiteness Index and arrive at the instant invention. Withdrawal of the rejection is respectfully requested.

The Rejection Of Claims 1, 3-16 Under 35 U.S.C. 103 (a)

Claims 1,3-16 are rejected under 35 USC § 103(a) as unpatentable over Hansen et al. ('256) in view of Hansen et al. US 5,789,326 ('326).

For a *prima facie* rejection, there must be a suggestion, teaching or motivation, either in the references or in the knowledge generally available to modify a reference, there must be a reasonable expectation of success, and all the claim limitations must be taught or suggested in the prior art.

The disclosure of Hansen et al, ('256) has been addressed above. Like the '256 disclosure, the '326 disclosure concerns polymeric and non-polymeric binders for fibers and the use of such binders in binding particles to fibers. In particular embodiments the invention concerns binding particles or superabsorbent particles to cellulosic fibers which may then be used, for example, to make absorbent fibers that are densified and incorporated into cellulosic products.

Binders form coordinate covalent bonds or hydrogen bonds. On the other hand polycarboxylic acid crosslinking agents can react with, for example, cellulose to form a covalent bond with cellulose. When this occurs, the crosslinking agent which may have been able to act as a binder also no longer has any binding capability.

In one aspect the Hansen et al. reference (the '326 patent) describes a wet laid web of fibers having hydrogen bonding functionality and the binder molecules having at

least one functional group capable of forming a hydrogen bond or coordinate covalent bond with particles and at least one functional group capable of forming a hydrogen bond with the fibers column 3, lines 13-23. In another aspect the patent also describes high bulk fibers with hydrogen bonding functionality and similar binder characteristics.

The Examiner states that Hansen et al. ('326) discloses crosslinked cellulosic fibers comprising particle binders in the Abstract. For clarification, the reference in the Abstract refers only binding particles to cellulose fibers, it does not refer to crosslinked fibers or the covalent bonds that occur when cellulose fibers are crosslinked with a crosslinking agent. The particles have functional groups capable of forming a hydrogen bond or coordinate covalent bond. The binders have at least one functional group capable of forming a hydrogen bond or coordinate covalent bond with the particles and at least one functional group capable of forming a hydrogen bond with the fibers.

The column 10 reference, lines 26-40 relates only to a method for binding particles to fibers. The fibers can be cellulosic or synthetic to which superabsorbent particles are adhered by a binder. The '326 reference includes a combination of wood pulp and certain binders which are bulk fibers in roll form. The preferred bulk fibers are wood pulp fibers or softwood pulp fibers. The pulp fibers can be chemical, thermomechanical or chemithermomechanical or combinations of these. The preferred fiber is a chemical fiber and suitable fibers include wood pulp fibers obtained from the kraft and sulfite processes. Thus, contrary to the Examiner's statement the reference does not disclose crosslinked cellulosic fibers comprising particle binders. Furthermore, it does not refer to fibers crosslinked with a crosslinking agent in the presence of a polyol.

The column 45, lines 30 -33 reference relates to application of a crosslinking agent of a mat followed by fiberizing, drying and curing to form high bulk fibers. This reference also does not disclose crosslinking of cellulose fibers in the presence of a polyol, rather, a single crosslinking agent, *dimethyloldihydroxyethylene urea* is disclosed and is used alone. This reference is only used to show crosslinking of cellulosic fibers to produce high bulk fibers.

It is within the overall context of forming high bulk fiber with intrafiber covalent crosslinks, column 42, line 16 – column 46, line 32, that Hansen et al. state in column 45, lines 67- column 46, line 2 that particle binders and particles can be added before, after, or simultaneously with curing. Curing in the presence of a binder is not usually a problem because the binder cannot participate in the intra fiber crosslinking reaction and the binder is not affected by the curing step. In certain situations, however, the binder can function as a crosslinking agent and form covalent intrafiber crosslinks. *Polycarboxylic acids (such as citric) polyols (such as propylene glycol) and polyamines (such as ethylene diamine)* can function as crosslinking agents and are consumed during the curing step in the formation of covalent crosslinks, column 46, line 8-12. Sorbitol is only cited in Claims 3 and 4 as a non-polymeric binder that has at least one functional group capable of forming a hydrogen bond or coordinate covalent bond with particles having a hydrogen bonding or coordinate covalent bond forming functionality. Note that Hansen et al. do not state that *combinations* of polyols, polycarboxylic acids and polyamines can be used for crosslinking. Rather, in the context of Example 24, column 45, line 37 and 38 where *dimethyloldihydroxyethylene urea* is applied to a mat (as a crosslinking agent), that Hansen et al. state that *polycarboxylic acids (such as citric) polyols (such as propylene glycol) and polyamines (such as ethylene diamine)* can function as crosslinking agents. That is, any one of these materials can be substituted, for example, for the *dimethyloldihydroxyethylene urea*. Accordingly in the limited case in which the crosslinking agent is also a binder, steps should be taken to prevent the binder from being consumed as a crosslinker in the curing step thus maintaining its binding ability. (Here again Hansen et al. do not state combinations of *binders such as, for example, a polycarboxylic acid and a polyol*) are used in the crosslinking reaction. In column 42, line 61 to column 43, line 14 and particularly column 43, line 8, Hansen et al. only indicate preferred types of crosslinking substances such as various urea derivatives including DMDHEU. Polycarboxylic acids such as citric acid are also cited. In the context of this reference, however, Hansen et al. are silent as to the presence of the addition of binders with a crosslinking agent. Hansen et al. state that the fibers should contain at least 20 % by weight water to retard curing so

that adequate *binder functional groups* will remain in the fibers to bind the particles to the fibers, column 46, lines 18-26. Stated in another way, crosslinking with the binder destroys the binder and makes it unavailable to bind the particles, the very object of the Hansen et al. reference and therefore the skilled artisan would not look to the Hansen et al. reference for crosslinking which makes his invention inoperative. Applicants submit that even in these situations where the binder may act as a crosslinking agent, Hansen et al. do not teach the combination of a crosslinking agent and a polyol in the intrafiber crosslinking reaction to arrive at the instant invention of Claim 1. Neither do Hansen et al. disclose which polyol is in combination with which polycarboxylic acid and the level of polyol as in the instant invention. Furthermore, Hansen et al. is only an invitation to virtual endless experimentation. Hansen et al. give no guidance to the skilled artisan as to which binders or combination of binders from the group to select to achieve the instant invention. While Hansen et al. state that polycarboxylic acids, polyols and polyamines *can* crosslink, there is no guidance given as to which genus or species within the genus, in combination, can crosslink to arrive at the instant invention. Thus the skilled artisan would be required to perform virtually endless experimentation to arrive at the instant invention.

The '326 patent does not require either the binder or the crosslinking agent to be a polyol as do the instant claims which require a crosslinking agent and a polyol. In addition, the Stoyanov Declaration shows that some polyols such as sorbitol and xylitol do not crosslink at the levels claimed.

Neither of the Hansen et al. references provide a motivation to crosslink cellulose with a crosslinking agent in the presence of a polyol since when a polyol such as sorbitol and a crosslinking agent such as citric acid are used independently in a crosslinking reaction the Whiteness Index is adversely affected, particularly in the case of citric acid as shown in the Stoyanov Declaration. Thus the skilled artisan would not be motivated to explore the combination yet when the combination is used, it has been surprisingly and unexpectedly discovered that Whiteness Index results are significantly increased over a control sample. The references do not teach the type of crosslinking agent nor the type and amount of polyol as in the instant invention. The Hansen et al. references are only an invitation to virtual endless experimentation.

They give no guidance to the skilled artisan as to which binders or combination of binders from the group to select to achieve the instant invention. While the Hansen et al. references state that polyols, polyaldehydes, polycarboxylic acids and polyamines *can* crosslink, there is no guidance given as to which genus or species within the genus, in combination, can crosslink to arrive at the instant invention. Thus the skilled artisan would be required to perform virtually endless experimentation to arrive at the instant invention. Furthermore, the Hansen et al. references do not disclose the Whiteness Index, the *L*, *a* or *b* values or the brightness claimed. Withdrawal of the rejection is respectfully requested.

Double Patenting Rejection

Claims 1, 5-8 and 10-15 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over (renumbered) claims 1-9 and 11-12 in copending Application No. 10/748977.

Claims 1, 5-8, 10-12 and 16-17 are provisionally rejected under the doctrine of obviousness-type double patenting as being unpatentable over Claims 1-8 and 13 of copending Application No. 10/815206.

Claims 1-8, 10, and 12-16 are rejected under the doctrine of obviousness-type double patenting as being unpatentable over Claims 1-11 of copending Application No. 10/748969.

Applicants note the double patenting rejection and will file a terminal disclaimer on the notification of allowable subject matter.

CONCLUSION

Based on the remarks, the Examiner is respectfully requested to withdraw the rejection of the claims and to promptly allow the case and allow it to issue. If the Examiner has any further questions, he is invited to call the Applicant's Agent at the number listed below.

Respectfully submitted

A handwritten signature in black ink, appearing to read 'D. Unrau', is written over a large, loopy circular mark.

David G. Unrau

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Direct Dial 253-924-2439